

Lord Mayor, and in the course of his remarks referred to the attitude of science toward the public and of the public toward science; he pointed out that although there are branches of science which cannot be popularised, the practical results can be described.

The vote of thanks was heartily accorded, and the Lord Mayor having briefly acknowledged it, the meeting dispersed. The following telegram was dispatched to the Lord Mayor of Bristol:—

“Lord Mayor of London, on behalf of British Science Guild at annual meeting, sends warm congratulations to Lord Mayor and city of Bristol on generous munificence of Mr. Wills to Bristol University College, and hopes soon to welcome University of Bristol.”

The following reply was subsequently received from the Lord Mayor of Bristol:—

“On behalf of my fellow-citizens and myself I beg to thank your lordship and the British Science Guild for your warm congratulations on the munificent promise towards the endowment of a Bristol University by our fellow-citizen, Mr. Harry Overton Wills.”

J. MACFARLANE GRAY.

WE regret to announce the death of Mr. John Macfarlane Gray on January 14, at his residence in Edinburgh, in his seventy-sixth year. Mr. Gray had a varied experience as an engineer, and was for many years chief examiner for marine engineers at the Board of Trade. The work which first brought him into prominence was his invention in 1866 of the steam steering gear which was first applied to the *Great Eastern*. The results led eventually to the general adoption of the system. Mr. Gray contributed numerous important papers to the various institutions to which he belonged, and frequently took part in discussions at the meetings, his contributions being characterised by pugnacious humour and sound knowledge of the subject. His contributions to scientific knowledge were for a time curtailed by the action of the Board of Trade, who, on the ground that the individual opinion of any of their engineering officers must not be made public, refused him permission to discuss the report of a research committee of the Institution of Mechanical Engineers. Fortunately he had previously been able to publish the results of his important investigation of the Theta-Phi diagram.

The most valuable of Mr. Gray's papers were probably those on the theoretical duty of heat in the steam engine (Institution of Naval Architects, 1885); the ether pressure theory of thermodynamics applied to steam (*ibid.*, 1889); the rationalisation of Regnault's experiments on steam (Institution of Mechanical Engineers, 1889, and Royal Society, 1900); and the variable and absolute specific heats of water (Institution of Civil Engineers, 1901).

Mr. Gray was a member of the Institution of Mechanical Engineers. He was a vice-president of the Institution of Naval Architects, and vice-president of the Institution of Marine Engineers from its inception. Of humble origin, he was essentially a self-trained engineer, and his early training undoubtedly influenced his attitude towards scientific research, his independence of judgment being specially noticeable. His seventy-six years show a record of useful activity, and he may be said to have created a field of investigation for younger engineers, who have fully recognised the influence of his guidance. An excellent portrait of Mr. Gray accompanies the lengthy biography published in *Engineering* of January 17, from which source these brief particulars have been drawn.

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NOTES.

We regret to see the announcement of the death, on January 4, of Prof. C. A. Young, for many years professor of astronomy at Princeton University, at the age of seventy-three.

DR. FEODOR CERNYSHEV, St. Petersburg, has been elected a foreign correspondent of the Geological Society of London.

PROF. REGINALD W. BROCK, professor of geology in the Queen's University, Kingston, has been appointed director of the Geological Survey of Canada.

At the annual meeting of the Royal Meteorological Society on January 15, the Symons memorial gold medal was presented to M. Leon Teisserenc de Bort, of Paris, “in consideration of the distinguished work which he has done in connection with meteorological science, especially the study of the upper air.”

THE freedom of the city of Glasgow was conferred upon Lord Lister on Tuesday at a large and representative meeting of citizens, over which the Lord Provost, Sir William Bilsland, presided. In making the presentation, the Lord Provost recalled Lord Lister's connection with the city while professor of surgery at the University and visiting surgeon at the Royal Infirmary, where he achieved world-wide distinction as an investigator and a surgeon by discovering and perfecting the antiseptic system of treating wounds, which marked a new epoch in modern surgery. Lord Lister was unable to be present at the meeting owing to his condition of health, but a letter was read from him in which he said:—“Having in due time been elected by the managers of the Royal Infirmary as surgeon to that institution, I experienced uniform consideration at their hands when applying to the treatment of wounds the great truth which had been recently revealed by the illustrious Pasteur regarding the nature of fermentative changes in organic substance. That truth, though it seemed to me to shine clear as daylight from Pasteur's writings, was for many years not generally recognised, and thus it was my privilege to witness in my own practice, as the application of the principle became greatly improved, the revelation of pathological truths of fundamental importance and a revolution in practical surgery, and I looked upon the years spent in your city as the happiest period in my life.”

ON Tuesday next, January 28, Prof. F. J. Haverfield will deliver the first of two lectures at the Royal Institution on Roman Britain. The Friday evening discourse on January 31 will be delivered by Prof. Rutherford, on recent researches on radio-activity, and on February 14 by Dr. C. W. Salter, on biology and history. The discourse on March 13 will be delivered by Signor G. Marconi, his subject being Transatlantic wireless telegraphy.

AT the annual meeting of the Entomological Society on January 15, the following fellows were elected as officers and to serve on the council for the session 1908-9:—*President*, Mr. C. O. Waterhouse; *treasurer*, Mr. A. H. Jones; *secretaries*, Mr. H. Rowland-Brown and Commander J. J. Walker; *librarian*, Mr. G. C. Champion; *other members of the council*, Dr. T. A. Chapman, Mr. A. J. Chitty, Mr. A. Harrison, Mr. W. J. Kaye, Dr. G. B. Longstaff, Mr. H. Main, Mr. G. A. K. Marshall, Prof. R. Meldola, F.R.S., Prof. L. C. Miall, F.R.S., Prof. E. B. Poulton, F.R.S., Mr. R. Shelford, and Mr. G. H. Verrall. The president read his address, which

dealt chiefly with the present unsatisfactory state of nomenclature in entomological science. He also advocated the establishment of a central "type" museum, on the lines of an experimental collection now formed at South Kensington, for the purpose of loaning specimens to institutions, whereby it was suggested that the existing confusion might be avoided, and the general work of identification made easier.

At a meeting of friends of the late John Samuel Budgett held in Cambridge on February 8, 1904, it was decided to perpetuate his memory by the publication of a memorial volume which should contain reprints of his various zoological papers, together with descriptions of the more important material brought back by him on his various expeditions. The syndics of the Cambridge University Press undertook the responsibilities of publication, the necessary expenses of illustration being met by a fund subscribed by Budgett's friends. The volume has been edited by Prof. Graham Kerr, and Mr. A. E. Shipley, honorary treasurer of the fund, has contributed a biographical sketch. The preparation of the volume has taken a considerable time, particularly the working through of the extensive embryological material of *Gymnarchus* and *Polypterus* so as to make it possible to give a fairly complete sketch of the development of these forms.

WE regret to announce the death of Dr. H. G. Knaggs in his seventy-sixth year. Though little known to the present generation of entomologists, his name deserves to be honoured as that of one of the founders of the *Entomologists' Monthly Magazine* in 1864. At that time he possessed one of the finest collections of British Lepidoptera in existence, but ten years later he found that his professional engagements required all his attention, so he sold his collection and withdrew from the staff of the magazine, to which, however, he continued to contribute occasionally up to July, 1906. He also published one or two small books and pamphlets, especially "The Lepidopterist's Guide," one of the most useful publications on the collection and preservation of these insects which we possess. It originally appeared in separate papers in the early volumes of the *Entomologists' Monthly Magazine*, and was afterwards enlarged and published in book form, and has gone through several editions. Dr. Knaggs was born on March 21, 1832, in High Street, Camden Town, and was educated at University College School, and trained for the medical profession at University College Hospital. He practised as a medical man in Kentish Town and Camden Town until about ten years ago, when he retired in consequence of ill-health, and settled at Folkestone, where he died after a long and painful illness on January 16. His remains were interred in Highgate Cemetery on January 20, in the presence of a small company of relatives and friends.

Nos. 5 and 7 of vol. li. of the Bulletin of the Museum of Comparative Zoology at Harvard College are devoted to echinoderms. In the former, Messrs. A. Alexander and H. L. Clark describe the echinuses collected during the cruise of the *Albatross* in the North Pacific. In the latter, Mr. Clark publishes a revision of the *Cydaris* group, with a full account of the intricate questions connected with nomenclature.

THE "waltzing instinct" in ostriches forms the subject of an article by Dr. J. E. Duerden in the Journal of the South African Ornithologists' Union for December, 1907. Ostriches, it appears, are in the habit of running off suddenly with a peculiar whirling movement, sometimes one way, sometimes another, simultaneously spreading

their wings, which are alternately raised and depressed. These movements, the author suggests, may be connected with escape from the clutches of the large Carnivora. "Indulged in instinctively as play while young, and even when adult, the performance gives the bird expertness in the rapid jerking movements which are those first followed on alarm."

THE use of chrysanthemum powder as a means of destroying mosquitoes in houses is strongly recommended by Dr. A. L. Herrera, of Mexico City, in a paper published in the Proceedings of the nineteenth annual meeting of the Association of American Economic Entomologists (U.S. Department of Agriculture, Entomological Bulletin No. 67). Care has to be exercised in order to avoid the production of throat-inflammation in the operator, and also against ignition, but if proper precautions are taken in these respects, the powder seems to produce most satisfactory results. The consumption of the powder has largely increased during the last year, while the sale of tablets, which only paralyse the insects, and at the same time give off noxious fumes, has shown a corresponding decrease.

AN interesting addition to the exhibition galleries of the British Museum (Natural History) has been made in the shape of a copy of a water-colour drawing made about 1585 by John White, containing the earliest known representation of the American king-crab, *Limulus polyphemus*. John White, who was one of the first settlers in Virginia, of which he was for some time Governor, served as lieutenant to Sir Walter Raleigh. In three volumes of drawings by him preserved in the department of prints and drawings in the British Museum, many of the delineations of natural objects are of great beauty, and show a fidelity to nature rare at the period. The drawing in which the king-crab is depicted was engraved, with some modifications, for de Bry's "America" ("Grands Voyages," part i., pl. 13) in 1590. In the engraving the king-crab is, however, shown in somewhat greater detail, thus suggesting that the engraver had an actual specimen or another drawing from which to copy.

IT is encouraging to find Dr. Whitehead, Bishop of Madras, giving an example to other missionaries of the true method of dealing with the beliefs of those non-Aryan tribes which offer the most promising field for Christian work in India. He is, we believe, a comparative stranger to the people of the south, and hence his essay lacks that intimate familiarity with these strange cults which is essential to one whose mission is to comprehend and refute them. But in his pamphlet on "The Village Deities of Southern India," recently published in Mr. Thurston's valuable series of Bulletins of the Madras Museum, he has collected much curious information hitherto inaccessible to English students. Although most of his facts appear to have been derived from Christian converts, his account of these strange beliefs seems as complete as is possible in the present state of our knowledge. He points out that these deities are usually female, are almost universally worshipped by animal sacrifice, and that their priests are not Brahmins, but drawn from the lower castes. He describes in detail the grosser modes of sacrifice, which he regards as not in the nature of gift or propitiation, but as methods of gaining communion with the deity. This study of the seamy side of Hinduism shows that this comprehensive faith is not, as is too commonly believed, a purely philosophical creed. His essay will be useful to ethnologists as a study of the lower beliefs of a pagan polytheism, which, crude and monstrous as some of its

practices are, is still on a higher level than the foul Sáktá worship current in Bengal, to which it presents many obvious analogies.

In the *Times* of January 17, Dr. H. R. Mill gives an interesting statement of the rainfall of the British Isles during the past year, compiled from a preliminary examination of the large mass of material so far received from the observers of the British Rainfall Organisation. It shows that, for the United Kingdom generally, the year 1907 was not a wet one, despite the popular belief, but that, in fact, the rainfall was very close to the average of thirty years (1870-1899). Expressing the amounts in percentages, the following provisional values are obtained:—

General Rainfall in 1907. Average=100.

England (South)	Wales	England (North)	Scotland	Ireland	British Isles
99	101	97	106	102	101

The most prominent features were the very wet three months of spring and early summer, and the extremely dry September; this month scarcely yielded a quarter of its average rainfall in England and Wales, and less than a third for the British Isles as a whole. In London (Camden Square) the annual fall was 23.01 inches, 8 per cent. below, and the number of rain-days 9 per cent. above, the average of fifty years (1858-1907). Dr. Mill states that the large number of rain-days, combined with the unusually low temperature of the summer, quite account for the general impression that last year was very wet in London.

In *Mitteilungen aus den deutschen Schutzgebieten* (vol. xx., part iii.) there is an important discussion of the climate of Swakopmund by A. Gülland, based on observations for the years 1899-1905. Swakopmund lies in 22° 42' S. lat., on the west coast of the German South-West African Protectorate.

A PAPER on the fruits and seedlings of *Rhus succedanea*, contributed by Mr. S. Tabata to the Journal of the College of Science, Tokio (vol. xxiii., article 1), furnishes a brief account of a microchemical examination of the substances found in the fruits. The fruits are the source of the fat or tallow that enters into commerce as Japan wax. The fat is present in all parts, but only assumes a waxy consistence in the mesocarp. Before germination of the seeds, the cotyledons contain fat, magnesia, and proteins in considerable quantity, but no starch. Starch is formed during germination at the expense of these substances.

AN article on the absorption spectrum of protochlorophyll is communicated to the *Bulletin du Jardin impérial botanique*, St. Petersburg (vol. vii., part ii.), by Mr. N. A. Monteverde. An alcoholic solution of the colouring matters prepared from the leaves of etiolated oats and wheat plants provided the protochlorophyll and accessory yellow pigments. Five bands were observed in the absorption spectrum, of which one in the blue is attributed to the yellow pigments, and the other four, in the orange, yellow, green, and blue, are referred to the protochlorophyll.

THE first of a series of papers by Dr. L. Cockayne dealing with the coastal vegetation of the South Island of New Zealand is published in the *Transactions of the New Zealand Institute*, vol. xxxix. In this part the author presents a general sketch of the coastal plant covering. Although the saline nature of the soil and the strong winds are recognised as potent factors influencing distribution, the opinion is expressed that the coastal plants as a whole occupy their peculiar station, not from choice, but from necessity, having been driven out of more favour-

able situations by better equipped competitors. The vegetation of the South Island below the parallel of 42° S. bears the impress of a subantarctic origin in some of the coastal formations, whereas in the North Island a subtropical element is more characteristic. Of ninety-four species enumerated, more than half are endemic and thirteen are subantarctic.

UNDER the title of "Heredity and Forestry," Prof. W. Somerville discusses in the *Transactions of the Royal Scottish Arboricultural Society* (vol. xxi., part i.) an interesting matter with regard to the results obtained by sowing seed of forest trees from different localities. Comparative experiments in Switzerland have shown that plants raised from the seed of the common spruce grown at a high elevation, e.g. 6000 feet, make much slower growth than plants raised from seed grown at a lower elevation, e.g. 2000 feet. Similar results have been recorded for spruce in Austria. Other characters, such as the weight of the seed, length of growing period, and possibly tendency to disease, appear to vary with the situation of the trees from which seed is taken. It becomes, therefore, important to obtain seeds for afforestation purposes from a locality similar to that in which the plantation will be made. The conclusions appertaining to the spruce do not necessarily apply to other trees, such as the Scots pine, for which data are not available.

MR. DRYSDALE TURNER contributes to the December (1907) number of the *Agricultural Students' Gazette*—the organ of the Royal Agricultural College, Cirencester—an interesting summary of the life-history of the warble-flies *Hypoderma lineata* and *H. bovis*. Considerable losses are caused by the ravages of this insect in Great Britain, and farmers and stock-keepers are fully alive to the necessity of keeping it in check. *H. lineata* resembles a bee in appearance, and can be seen from the middle of May to the beginning of September. It attaches its eggs to the hair on the various parts of the bodies of cattle, particularly the legs, just above the hoofs. The animal licks the place where the eggs are deposited, and the larvae are carried by the tongue into the mouth and to the gullet, through the walls of which they pass, and eventually lie just under the skin on the animal's back; the developed maggots finally work their way out of the skin about June, and fall to the ground, where they pupate. *H. bovis* probably has a similar history. Various remedial measures are quoted, and in particular it is stated that the parish of Bunbury, in Cheshire, has been freed from the pest by systematically destroying the maggots. The same journal also contains a *résumé*, by Prof. Duncan, of the regulations that have been made from time to time concerning contagious diseases in animals.

THE Journal of the Department of Agriculture of South Australia for November, 1907, contains an account of the wheat yield during the last decade, and the estimated yield for the present season. The figures are very striking; they are as follows:—1897-8, 2.64 bushels per acre; 1898-9, 4.91 bushels; 1899-1900, 4.64 bushels; 1900-1, 5.88 bushels; 1901-2, 4.60 bushels; 1902-3, 3.64 bushels; 1903-4, 7.72 bushels; 1904-5, 6.53 bushels; 1905-6, 11.46 bushels; 1906-7, 10.19 bushels. The fact that the last two seasons gave much higher yields than usual is attributed to the use of artificial manures and to timely rains. As the rainfall during the past twelve months is below the average, a yield of only 8.75 bushels is predicted for the present season. When we remember that the average wheat yield in Great Britain is 30.9 bushels, and the average of the yields of all other countries is 17.5 bushels,

it would appear that there is considerable scope in South Australia for agricultural investigation, and that a strong scientific staff would prove a really sound investment.

In a paper on "ghost images" published in the Journal of the Royal Microscopical Society, clxxxi. (December, 1907), Mr. A. A. C. E. Merlin discusses the resolution of the images of a substage stop formed by the secondary markings of the diatom *Coscinodiscus asteromphalus*. The diameter of the secondaries was $1/83300$ th of an inch, and the images appeared well defined under a magnifying power of about 3200. In connection with this effect, the author discusses the advantage of high magnification, independently of the question of resolving power, and especially advocates the use of powerful eye-pieces in studying minute structures. While a structure may be equally well defined under a lower magnification, and may be visible when it is known to exist, the author considers that for the recognition and detection of unknown detail a powerful eye-piece is a necessary adjunct to a picked objective.

THE Transactions of the Theosophical Congress for 1907 contain much matter that falls outside the range of "science" as included in the columns of NATURE. There are two papers on the dimensions of space which form in some ways an exception to the above statement, and the writer of one of these, who does not publish his full name, gives some diagrams by which it is possible to construct models of projections of the simpler four-dimensional solids. The author, however, considers that the sections of the 600-cell and the 120-cell "become so complicated as not at present to be worth calculating," and on p. 258 he shows by his own statements that he is unaware of the work that has been done in "exhausting" the regular figures in space of higher dimensions than four. Indeed, he says:—"It seems to me quite possible that we might find that in a five- or six-dimensional world *no regular hypersolids at all were possible.*" But a little thought can be made to show anyone with a small mathematical knowledge that the triangle-tetrahedron series, the square-cube series, and the octahedron series are capable of extension to space of any dimensions whatever.

THE December (1907) number of the periodical of popular science, *Himmel und Erde*, published by the scientific society "Urania," of Berlin, contains an article on the microscopic structure of photographic films by Dr. W. Scheffer. It is illustrated by twenty-two reproductions of photomicrographs, which show how the nuclei of silver salt are affected by various modifications of the times of exposure, the method of development, and the use of intensifiers and of restrainers.

THE December (1907) Bulletin of the Bureau of Standards contains the results of a long investigation on the Clark and Weston standard cells, by Messrs. F. A. Wolff and C. E. Waters. They conclude that the agreement between cells set up with different samples of mercurous sulphate prepared by any of the recognised methods, or by treatment of commercial sulphate with sulphuric acid, is highly satisfactory, and suggest that the standard cell should serve as one of the two fundamental electrical standards. It has been shown that the cells now constructed can be carried long distances without changes of electromotive force of more than a few parts in 100,000 being produced. It will be seen from this statement that the results obtained in America are in agreement with those found at the National Physical Laboratory and communicated to the Royal Society a few weeks ago.

An article on some of the present problems of radioactivity, by Dr. G. A. Blanc, appears in the December

(1907) number of *Le Radium*. The author considers that Rutherford's disintegration theory is the explanation of radio-activity, and asks whether disintegration is not taking place in all forms of matter? After reviewing the evidence for the α particle being either half an atom of helium with a unit charge or an atom with a double charge, he comes to the conclusion that neither is satisfactorily established. Nor is the genealogical tree of the radio-active elements yet made out. Is it possible, he asks, that lead and silver, which are so intimately associated in nature, belong to this tree, and that one is the parent of the other. The amount of radium in the earth's crust is more than sufficient to maintain the temperature constant, and now he finds there is more thorium present than is necessary to supply the heat required. He is sanguine that some means will eventually be found which will allow us to stimulate radio-active disintegration, and thus obtain a source of energy of which we can scarcely at present conceive.

THE product of the world's gold mines for the year 1906 could be all packed in a room 10 feet square and 9 feet high, says Mr. T. F. Van Wagenen in an article on gold in the current number of the *Popular Science Monthly*. The value of this 90 cubic feet of gold was nearly eighty-one and a half millions sterling and its weight nearly 674 tons. Very nearly one-third of this amount was obtained in South Africa, about one-fifth from Australasia, and nearly a quarter from the United States and Alaska. Eighty-three per cent. of the total output was secured by the Anglo-Saxon world. According to calculations and estimates made in 1900 by the director of the United States mint, the gold taken from the mines of the world since the discovery of America has amounted in quantity to about 21,424 tons, and in value to more than 2,520,000,000. Nineteen per cent., or nearly one-fifth of the whole, has been mined in the last ten years, and 30 per cent. in the last twenty years.

MESSRS. SAMUEL BAGSTER AND SONS, LTD., have published a fifth edition of Mr. W. T. Lynn's "Astronomy for the Young."

A SECOND edition of Mr. George J. Gray's "A Bibliography of the Works of Sir Isaac Newton, together with a List of Books illustrating his Works," has been published by Messrs. Bowes and Bowes, of Cambridge. The work has been revised and enlarged, and many important additions have been made.

THE first volume of the sixth edition of A. Wüllner's "Lehrbuch der Experimentalphysik," dealing with general physics and sound, has just been received from Mr. B. G. Teubner, Leipzig. The volume contains more than a thousand pages, about seven hundred of which are concerned with the general properties of matter, while the remainder deal with wave motion and sound. The price of this elaborate treatise on the fundamentals of physics is sixteen marks.

THE "International Geography," edited by Dr. H. R. Mill, and written by seventy authors, with special knowledge of the subjects on which they contribute articles, has been re-published by Messrs. Macmillan and Co., Ltd. The work is now issued, not only in one complete volume, but also in parts. The sections dealing respectively with the British Isles, Europe, Asia, Australasia, North America, South America, and Africa can be obtained separately. The parts each contain a selection of original questions and exercises, and a miscellany of questions set in various public examinations, and they should prove of great service in the higher classes of schools.